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PHOTOGRAPHIC INTERPRETATION REPORT

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June 1965

SOLID PROPELLANT ROCKET MOTOR TEST FACILITIES AND PROBABLE SOLID PROPELLANT PRODUCTION FACILITIES, USSR

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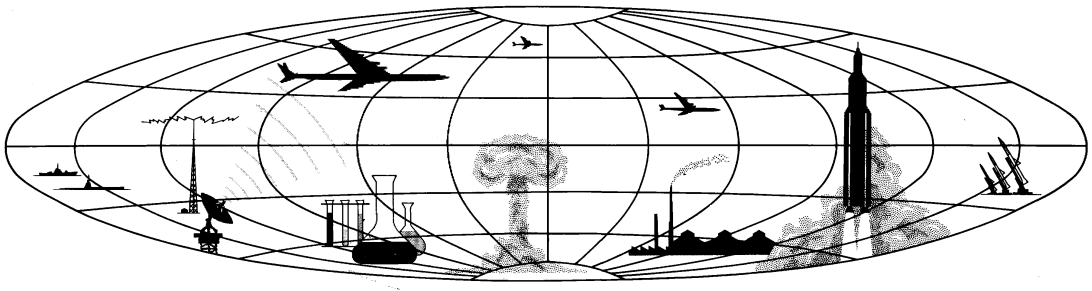

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PHOTOGRAPHIC INTERPRETATION REPORT

SOLID PROPELLANT ROCKET MOTOR TEST FACILITIES AND PROBABLE SOLID PROPELLANT PRODUCTION FACILITIES, USSR

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LIST OF ILLUSTRATIONS

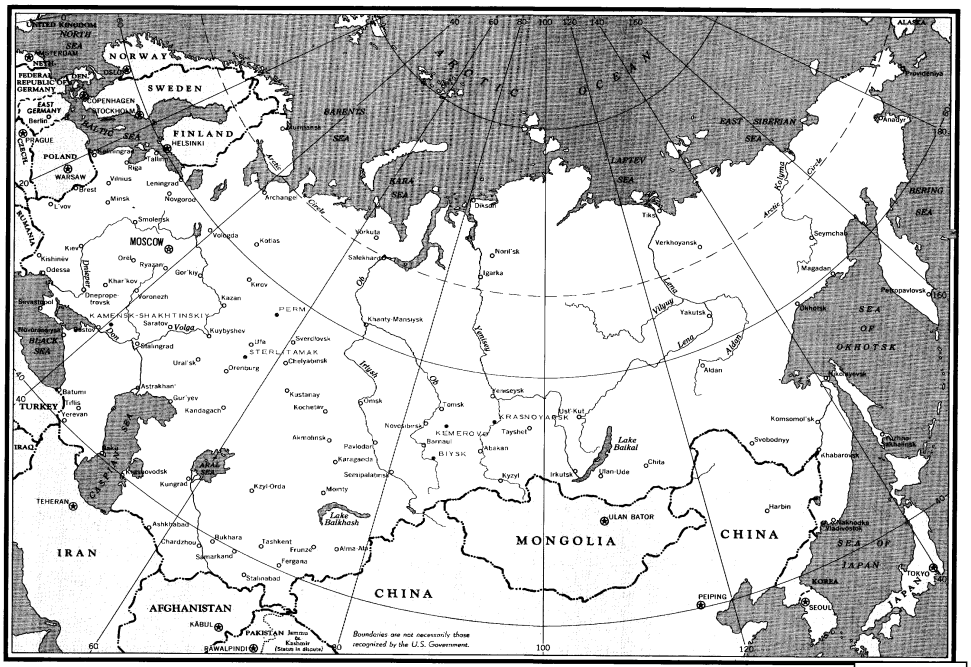

FIGURE 1. LOCATION MAP.

SUMMARY

Solid propellant rocket motor test facilities, all associated with pre-existing explosives plants, have been constructed in or near the cities of Biysk, Kamensk-Shakhtinskiy, Krasnoyarsk, Perm, and Sterlitamak in the USSR. A similar facility under construction at Kemerovo cannot as yet be confirmed as a solid propellant test facility. It differs from the others in that the appearance of the incompleted test facility suggests an intention to conduct vertical testing whereas the other 5 facilities are designed for horizontal testing. Construction on all of the test facilities began in 1961 or shortly after and has continued to the present, although most of them appeared to be virtually complete by the end of 1964.

Concurrent with the construction of the test facilities, additions have been made to the manufacturing facilities of the associated explosives plants. These additions to the manufacturing capabilities of the plants are considered probable solid rocket fuel production facilities. Possible casting facilities and temperature conditioning buildings have been constructed at all sites except Kemerovo.

INTRODUCTION

Five solid propellant rocket motor test facilities and one probable facility, all associated with pre-existing explosives manufacturing plants, are located at 6 different sites in the USSR (Figure 1). Interpretation of these installations as solid propellant rocket motor test facilities with associated probable solid propellants manufacturing sections rests primarily on the premise that the test-cell/deflector configurations were designed to test solid propellant rocket motors. If this premise is accepted, the inescapable conclusion is that the Soviets are engaged in the production and testing of large solid propellant rocket motors.

This report is based solely on photographic analysis. It is a comparative study of the 6 test facilities and the associated production facilities. The test facilities were the initial focal points of interest, all 6 having been first observed in early stages of construction either in 1961 or 1962. The generally concurrent development of probable solid propellant manufacturing sections as additions to the explosives manufacturing plants and their probable relation-

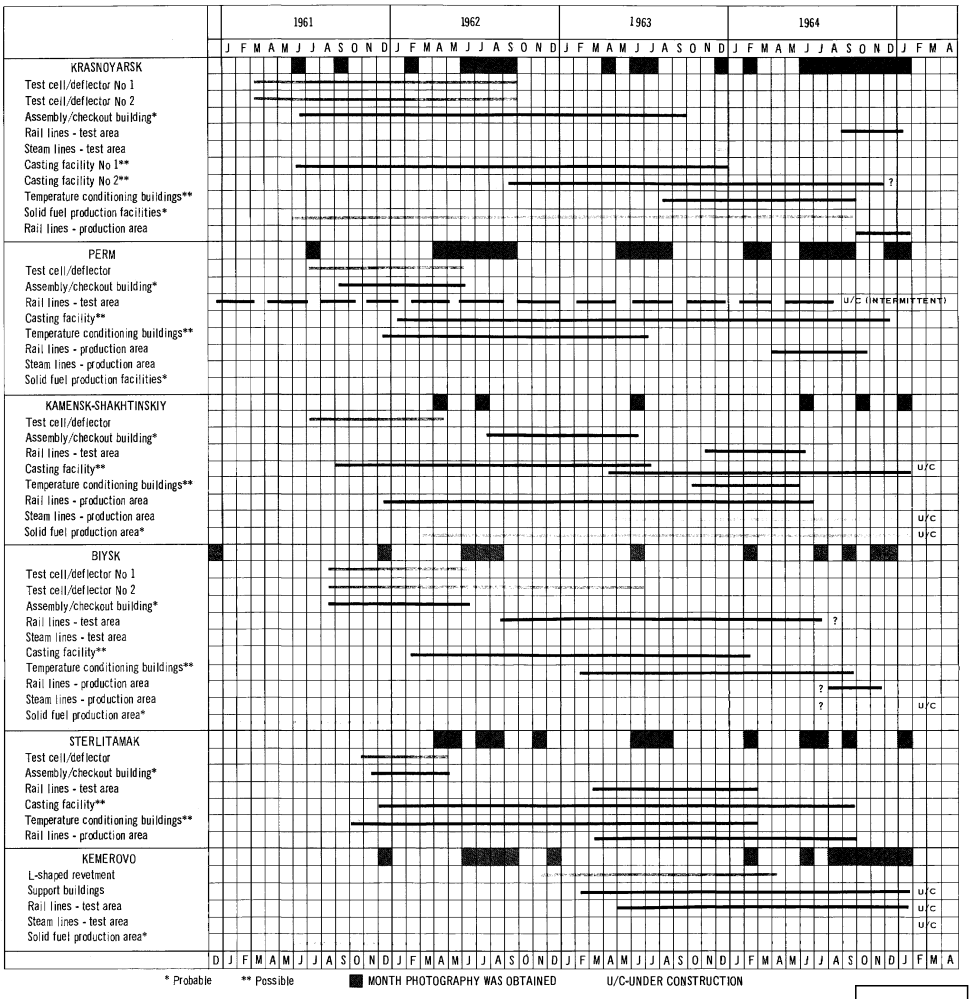

FIGURE 2. CONSTRUCTION CHRONOLOGY OF SOLID PROPELLANT ROCKET MOTOR TEST FACILITIES AND PROBABLE SOLID PROPELLANTS PRODUCTION FACILITIES.

ship to the test facilities was not immediately recognized.

Five of the 6 solid propellant rocket motor test facilities are directly comparable. These are located in or near the cities of Krasnoyarsk, Perm, Kamensk-Shakhtinskiy, Biysk, and Sterlitamak. Recent detailed reports on these facilities present a step-by-step picture of their development and functional interpretations of features they have in common. 1-5/ The sixth facility, located at Kemerovo, has some features in common with the other 5 facilities but differs from them in several important respects. 6/

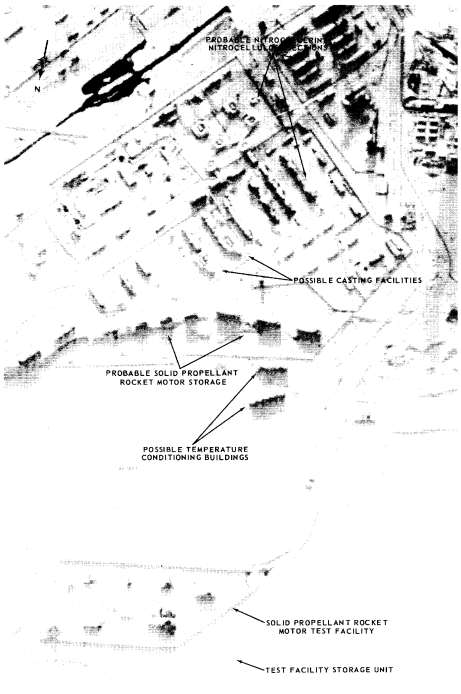

FIGURE 3. SOLID PROPELLANT ROCKET MOTOR TEST FACILITY AND PROBABLE SOLID PROPELLANT PRODUCTION FACILITIES, KRASNOYARSK,

FIGURE 4. SOLID PROPELLANT ROCKET MOTOR TEST FACILITY AND PROBABLE SOLID PROPELLANT PRODUCTION FACILITIES, PERM,

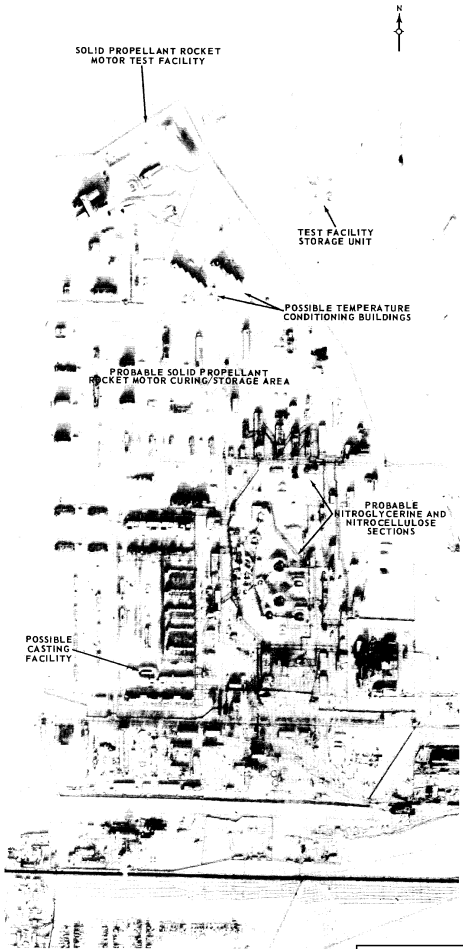

FIGURE 5. SOLID PROPELLANT ROCKET MOTOR TEST FACILITY AND PROBABLE SOLID PROPELLANT PRODUCTION FACILITIES, STERLITAMAK,

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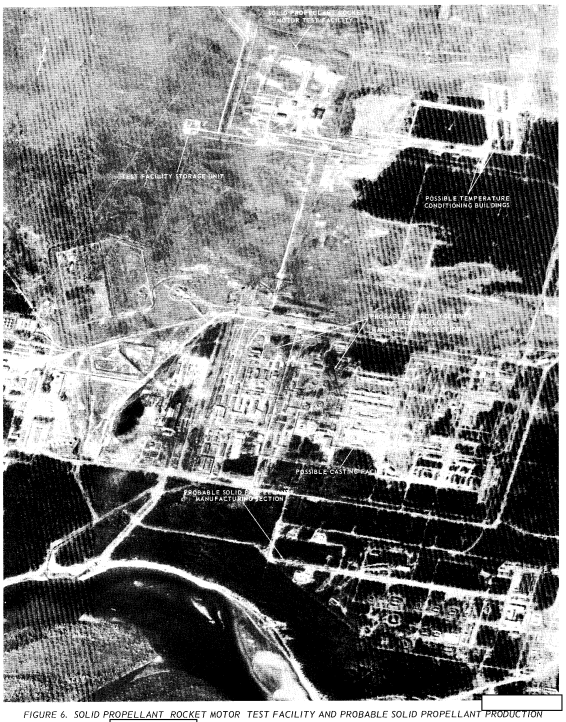

FIGURE 6. SOLID PROPELLANT ROCKET MOTOR TEST FACILITY AND PROBABLE SOLID PROPELLANT PRODUCTION FACILITIES, BIYSK.

FIGURE 7. SOLID PROPELLANT ROCKET MOTOR TEST FACILITY AND PROBABLE SOLID PROPELLANT PRODUCTION FACILITIES, KAMENSK-SHAKHTINSKIY.

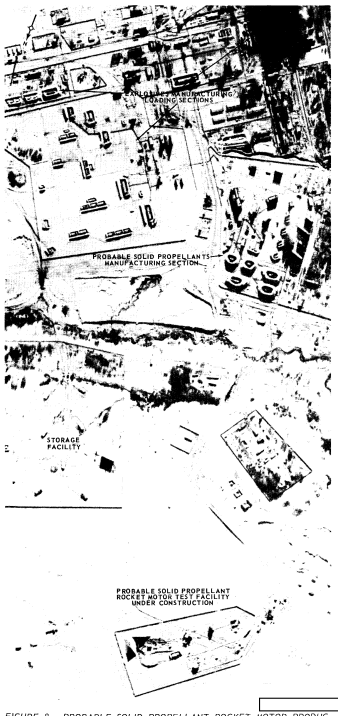

FIGURE 8. PROBABLE SOLID PROPELLANT ROCKET MOTOR PRODUCTION AND TEST FACILITIES, KEMEROVO.

The locations of the 6 installations by geographical coordinates and their Bombing Encyclopedia numbers are as follows:

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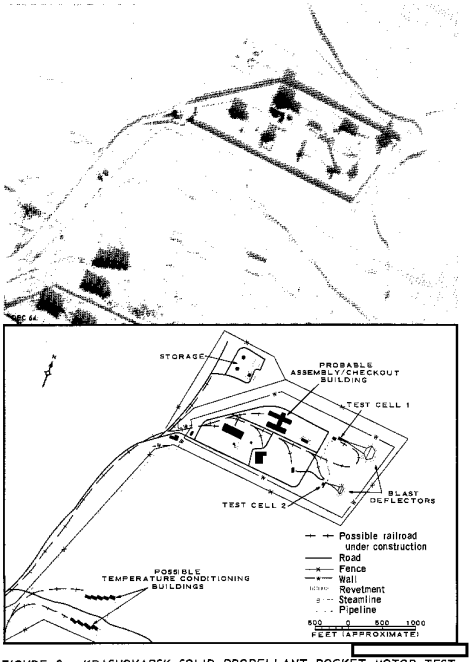
Biysk	52-31N	85-05E
Kamensk-Shakhtinskiy	48-18N	40-12E
Kemerovo	55-26N	85-57E
Krasnoyarsk	56-02N	93-03E
Perm	57-58N	55-52E
Sterlitamak	55-43N	55-57E

In this report, the following key features which most of the 6 installations have in common are compared: 1) test facilities as units, with separate comparisons of test cells/deflectors, probable assembly/checkout buildings, and separately secured storage units adjacent to the test facilities, 2) probable solid propellant manufacturing sections, 3) possible casting facilities, and 4) possible temperature conditioning facilities.

COMPARISONS OF THE INSTALLATIONS

The Soviets apparently initiated construction of solid propellant rocket motor production and testing facilities late in 1960 and maintained a similar construction schedule at all the installations considered in this report through the end of 1964 when the program appeared to be virtually complete except at Kemerovo. The chronological development of the various major components of the 6 installations is shown by means of a bar graph, Figure 2. Construction of the test facilities was most obvious on photography early in the program. It is now seen, however, that construction of specialized manufacturing sections in the associated explosives manufacturing plants began at about the same time and proceeded at about the same pace except at Kemerovo where some marked variations in the schedule may be noted.

The overall similarity of the layouts and of the physical relationships of the various test and production facilities of the 6 installations is apparent on the photographs which are presented on Figures 3 through 8. Detailed comparisons of the major components of the installations are made in the following sections of this report.



25X1 FIGURE 9. KRASNOYARSK SOLID PROPELLANT ROCKET MOTOR TEST FACILITY.

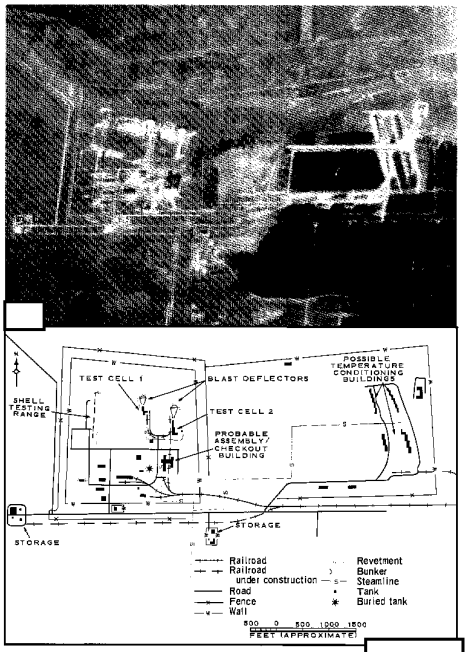


FIGURE 10. BIYSK SOLID PROPELLANT ROCKET MOTOR TEST FACILITY.

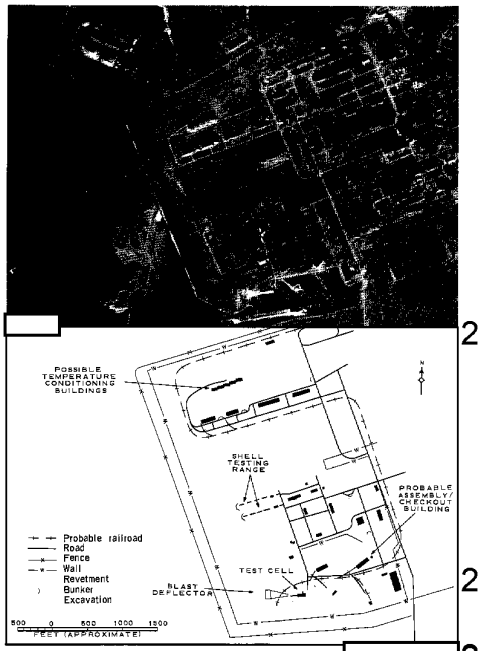


FIGURE 11. KAMENSK-SHAKHTINSKIY SOLID PROPELLANT ROCKET MOTOR TEST FACILITY.

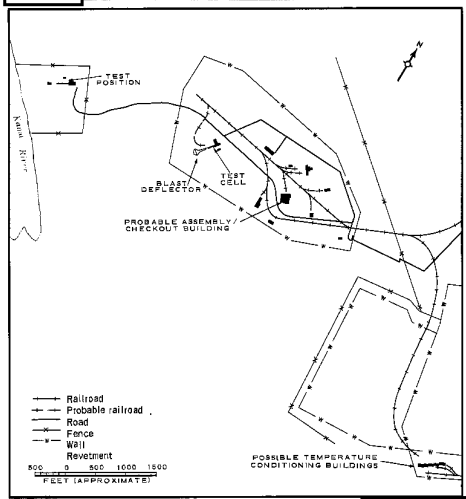


FIGURE 12. PERM SOLID PROPELLANT ROCKET MOTOR TEST FACILITY.

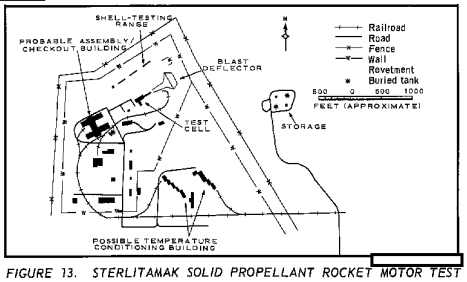
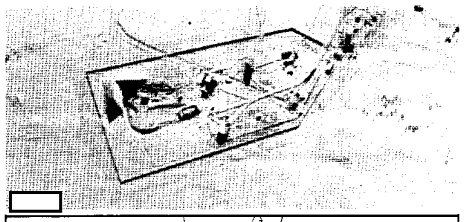


FIGURE 13. STERLITAMAK SOLID PROPELLANT ROCKET MOTOR TEST FACILITY.



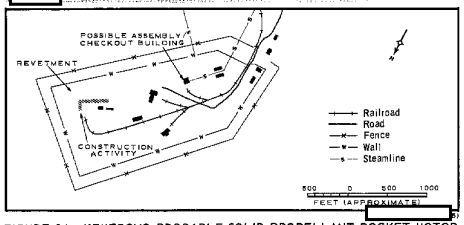


FIGURE 14. KEMEROVO PROBABLE SOLID PROPELLANT ROCKET MOTOR TEST FACILITY.

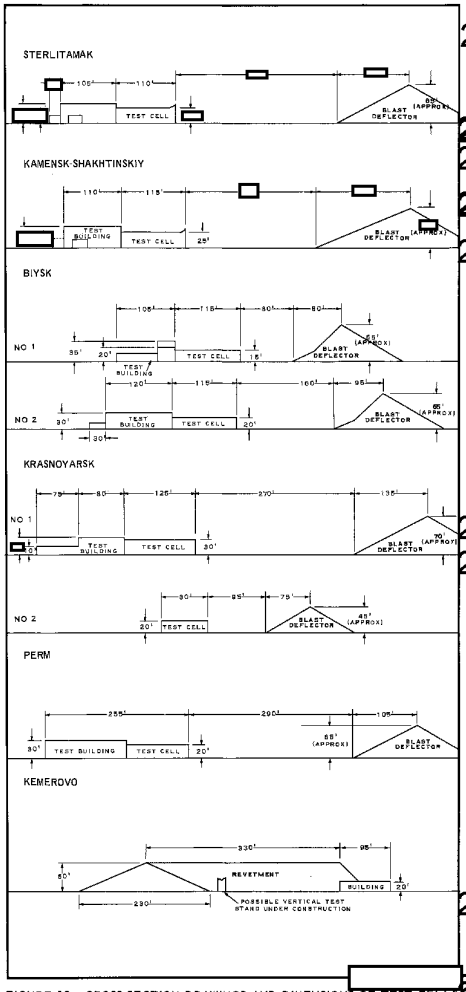


FIGURE 15. CROSS-SECTION DRAWINGS AND DIMENSIONS OF TEST CELLS AND BLAST DEFLECTORS.

TEST FACILITIES

The layouts, test cells/deflectors, support structures, and rail services of the test facilities at all 6 installations show much similarity. Another feature common to all except Kemerovo is the existence of a small separately secured sensitive component storage unit in the vicinity of each test facility. The similarities are illustrated in photographs and line drawings of the 6 test facilities which are presented on Figures 9 through 14 and in the perspective drawings on Figure 16. Detailed comparisons of the test cells/deflectors, the probable checkout/assembly buildings, and the separately secured storage units are made in the following paragraphs.

Test Cells and Deflectors

The test cells and their associated blast deflectors at all test facilities except at Kemorovo are very similar in appearance and are designed for horizontal testing. At Kemerovo the L-shaped revetment is probably not designed to be a blast deflector. At the other 5 facilities, deflection angles of the faces of the blast deflectors vary [redacted] to 30 degrees from the horizontal. The faces of the 2 deflectors at the Biysk test facility have 2 distinct angles, the lower parts of their faces being inclined at 25 to 30 degrees and their upper parts at about 40 degrees. Another unusual feature of the deflectors at Biysk is that they apparently have a deluge capability, a means of spraying the deflector faces with water. Horizontal pipes are apparently mounted a few feet away from the faces of the deflectors where the 2 deflection angles intersect.

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Longitudinal cross-section drawings of the test cells and blast deflectors at the 6 test facilities are shown on Figure 15. These are drawn to scale and represent as accurately as the data permits the dimensions, distances, and angles of the depicted test components.

The primary purpose of all the blast deflectors is thought to be the diversion of sound, heat, fragments, and possibly noxious gasses. In all cases except at Perm there are tilled fields in the back of the deflectors. At Perm the area back of the deflector is wooded, and there is a separate test position almost in line with the test cell/deflector configuration.

Probable Assembly/Checkout Buildings

Structures tentatively identified as assembly and checkout buildings at Biysk, Krasnoyarsk, and Sterlitamak are H-shaped, and the one at Perm appears to be a modified H-shaped structure (Figure 16). At Kamensk-Shakhtinskiy a rectangular structure approximately 115 feet in height may serve as the assembly/checkout building. There is a similar rectangular structure (separately secured) at Perm in addition to the modified H-shaped building. The Kemerovo test facility has no structure which can be compared directly with those at the other sites, although a building 50 feet tall (Figures 14 and 17) may house an assembly function when the facility is completed. In all cases, these structures are, or apparently will be, rail served. Plan drawings and elevations of the structures are presented on Figure 17.

Test Facility Storage Units

A small separately secured area is associated with each of the test facilities except at Kemerovo. Each of the areas contains 1 small revetted building, a large vacant revetment in the shape of a square with one side removed, and 2 possible tanks which are either earth covered or earth banked (Figures 3 through 7). These small secured sites are thought to be used for storage of sensitive components of rocket motors such as ignition devices. At Krasnoyarsk the storage unit is adjacent to the northwest corner of the test facility but is separately secured and may have its own rail spur (Figures 3 and 9). At Perm it is located at about midway between the test facility and the possible temperature conditioning buildings (Figure 4). The storage unit at Kamensk-Shakhtinskiy is to the southwest of the test facility and separated from it by a road and railroad (Figure 7). At Biysk it is immediately west of the test facility (Figures 6 and 10), and at Sterlitamak it is a short distance to the east (Figures 5 and 13).

PROBABLE SOLID PROPELLANT MANUFACTURING SECTIONS

Each of the test facilities is associated with an explosives manufacturing plant. All of the explosives plants are probably capable of manufacturing double-base powder, and some probably also manufacture high explosives of various types. In each case, the explosives plant antedates the rocket motor test facility. Of significance is the fact that expansion of the explosives plants has been concurrent with the development of test facilities. This plant expansion has consisted of probable solid propellants manufacturing sections (Figure 18) which were built during a 3-year period extending roughly from mid-1961 through mid-1964. Also during this period, possible casting facilities (Figure 19) were constructed in all of the explosives plants except the Kemerovo plant.

Krasnoyarsk

At Krasnoyarsk the probable solid propellant manufacturing section consists of 2 possible casting facilities, 7 storage buildings, and 2 large unidentified structures, all of which were built adjacent to the double-base explosives plant (Figures 3, 18, and 19). Pipelines and conveyer systems that link the possible casting facilities with the nitroglycerine/nitrocellulose production facilities suggest that double-base components (i.e., nitroglycerine and nitrocellulose) are the principal ingredients of the probable solid propellant produced at that location.

Perm

A situation similar to that in Krasnoyarsk exists at Perm where a probable solid propellant manufacturing section has been built on the southeast side of the explosives plant. It contains a possible casting facility (Figure 19), several storage buildings, and possible temperature conditioning buildings. In addition, however, a large new separate probable solid propellants manufacturing section has been built (Figures 4 and 18). The facilities of this large new production section at Perm are similar to those at Kemerovo and Kamensk-Shakhtinskiy.

Kamensk-Shakhtinskiy

An entirely new probable solid propellants manufacturing section has been built approximately 2 nautical miles southwest of the main explosives plant at Kamensk-Shakhtinskiy (Figures 7 and 18). This facility is almost identical to the new probable solid propellants manufacturing section at

Kemerovo. The possible casting facility at Kamensk-Shakhtinskiy was built in the older double-base part of the plant and appears to be equipped to utilize double-base components for the production of solid propellants (Figures 7 and 19). This facility differs from those seen at the other sites in that it consists of a large complex structure which is connected to 2 heavily revetted buildings rather than to 1 revetted building (Figure 19).

Biysk

The situation at Biysk is similar to that at Kamensk-Shakhtinskiy in that the possible casting facility is located in the older double-base area of the plant and is connected by conveyer lines to the double-base production elements (Figures 6, 18, and 19). A large probable solid propellants manufacturing section is located immediately south of the main plant area (Figures 6 and 18). In addition to the usual heavily revetted nitrating facilities in this new section, there are administration and engineering buildings, a large fabrication building, and several service/storage structures.

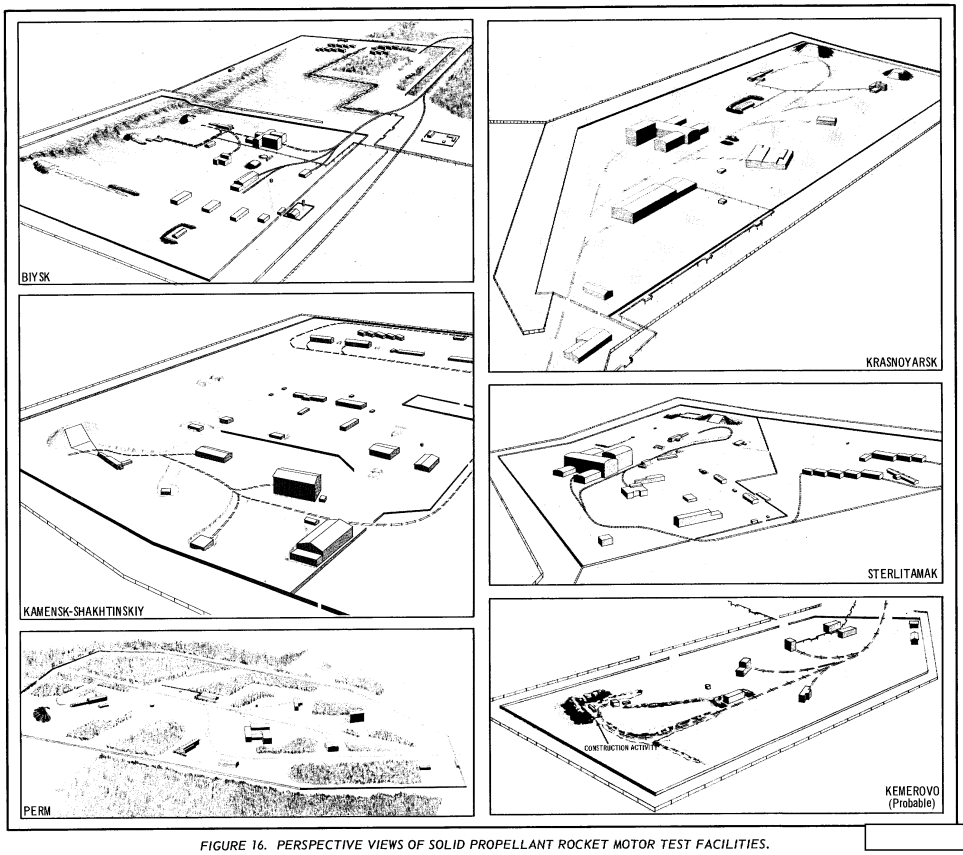

FIGURE 16. PERSPECTIVE VIEWS OF SOLID PROPELLANT ROCKET MOTOR TEST FACILITIES.

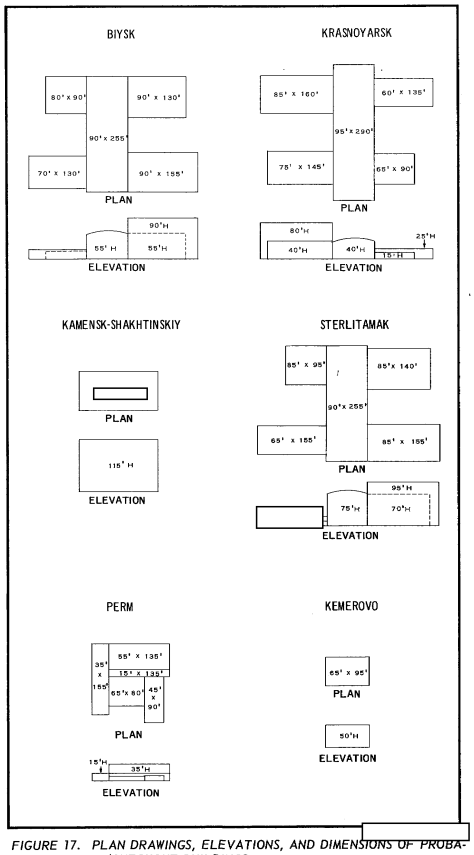

FIGURE 17. PLAN DRAWINGS, ELEVATIONS, AND DIMENSIONS OF PROBABLE ASSEMBLY/CHECKOUT BUILDINGS.

One of the revetted facilities is of particular interest because it is the only one of its kind found to date at any of the subject sites and because of its unusual configuration. It is a square building with a square high-bay section; the main part of the building is approximately 55 feet high and the high-bay section rises another 35 feet making a total height of approximately 90 feet.

Sterlitamak

At Sterlitamak (Figures 5 and 18) the possible casting facility (Figure 19) was built within the pre-existing double-base propellants plants as were some 12 other structures, including several possible solid propellant rocket motor storage buildings. Here again, the casting facility is linked by pipes and conveyers to the double-base production elements. The Sterlitamak and Krasnoyarsk installations are alike in that expansion has taken place within the explosives plants rather than in separate new sections.

Kemerovo

A new probable solid propellants manufacturing section has been built at the Kemerovo installation (Figures 8 and 18). It is essentially identical to the new section at Kamensk-Shakhtinskiy (Figures 7 and 18). To date, the Kemerovo facilities do not include a structure that is similar in any way to the possible casting facilities at the other sites, all of which have at least a generic resemblance to each other.

POSSIBLE CASTING FACILITIES

The possible casting facilities consist of large complex buildings connected to 1 or more heavily revetted buildings. Figure 19 presents a comparison of the possible casting facilities that are found at all the sites except Kemerovo.

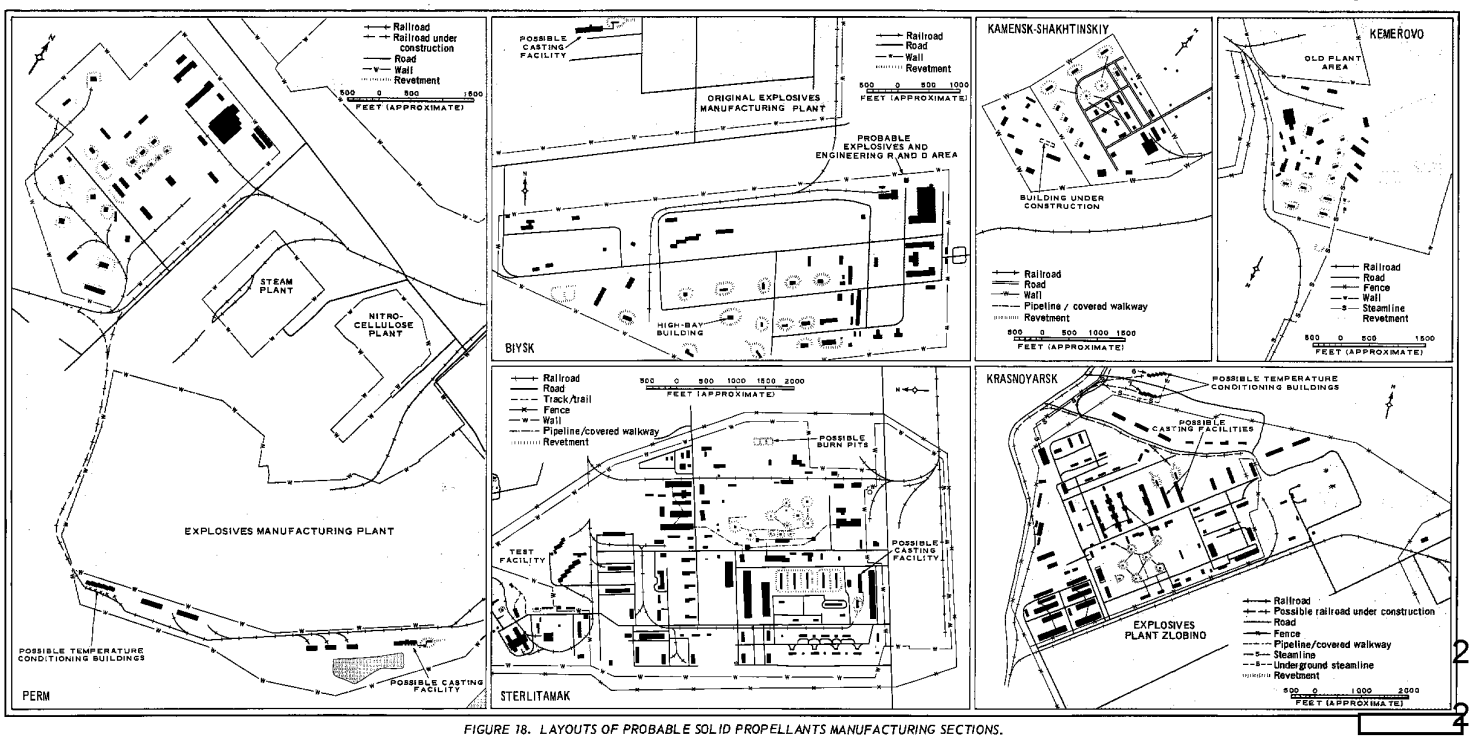

FIGURE 18. LAYOUTS OF PROBABLE SOLID PROPELLANTS MANUFACTURING SECTIONS.

The function of these facilities is not clearly understood; a reasonable explanation is that the various components which make up a solid rocket fuel are brought together in the unrevetted building, and the finished product is cast in the heavily revetted structure where it also may be cured by autoclaving and ultimately moved by rail into storage.

POSSIBLE TEMPERATURE CONDITIONING BUILDINGS

Possible temperature conditioning facilities (offset buildings) are present at all sites except Kemerovo (Figures 3 through 7). The interpretation of these structures as temperature conditioning facilities is based primarily on their unusual configuration which would permit economical maintenance of several different temperatures in one building. It is probable that all of these facilities are, or will be, provided with steam heat; some of them are definitely provided with steam lines. Dimensioned drawings of all the subject facilities are presented on Figure 20.

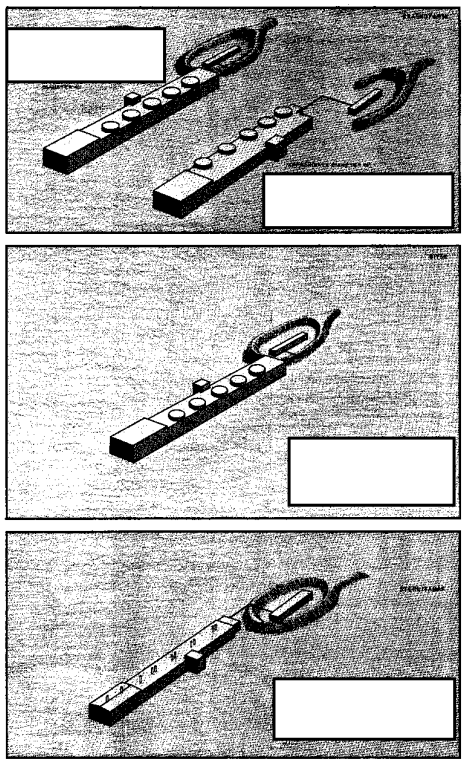

FIGURE 19. PERSPECTIVE VIEWS OF POSSIBLE CASTING FACILITIES.

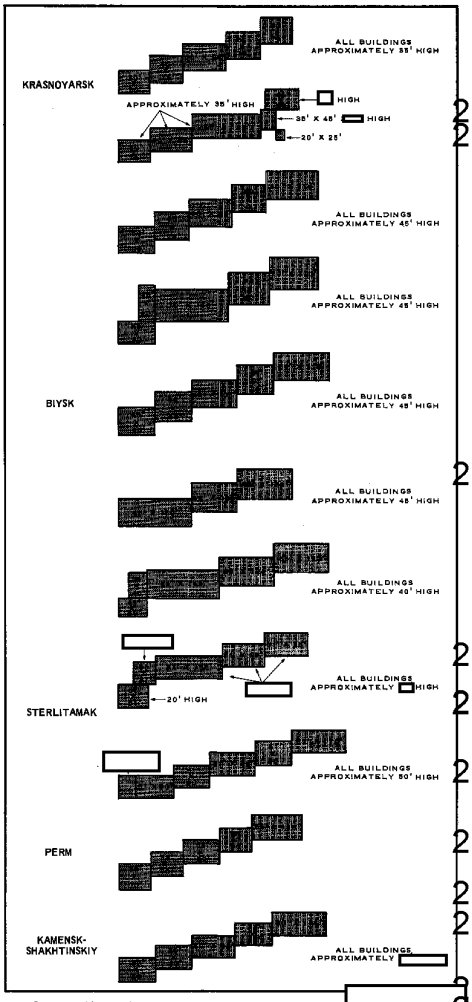

FIGURE 20. PLANS OF POSSIBLE TEMPERATURE CONDITIONING FACILITIES.

MAJOR DEVELOPMENTS IN PRODUCTION FACILITIES

In analyzing the various facilities that appear to be related to the production of solid propellants, it becomes evident that there are 2 major developments in the Soviet program at the 6 installations under consideration: 1) with the exception of Kemerovo, all the sites have recently constructed unique facilities, designated herein as possible casting facilities, that are physically connected to pre-existing double-base powder production elements; 2) at those locations where separate new probable solid propellants manufacturing sections have been built (Perm, Kamensk-Shakhtinskiy, Biysk, and Kemerovo) it is apparent that the facilities were built for the express purpose of producing nitrated substances that could be used as one of several components, or possibly the only major component, of a solid fuel for rocket motors.

COMMON ELEMENTS OF THE INSTALLATIONS

Elements common to solid propellant rocket motor test and production installations considered in this report are discussed in the following paragraphs.

1. Each of the 6 installations has an elaborate test facility which includes several large complex rail-served buildings, a revetted probable control building, and 1 or 2 test cells with their associated blast deflectors. All of the test cell/deflector pairs are designed for horizontal testing except the test facility at Kemerovo which is currently under construction. Present indications are that the Kemerovo test equipment may have been designed for vertical testing.

2. All installations are associated with pre-existing explosives manufacturing plants have double-base powder production capabilities and probably in some cases having high-explosives production capabilities. Relatively new facilities associated with the production of propellants and which are probably producers of solid rocket fuels have been built at all the plants during a period extending from 1961 through 1964. In several cases complete new explosives/propellants manufacturing sections have been built.

3. All installations have, or probably will have, a rail net linking the various components of the production and test facilities. These rail nets appear to have been expressly developed for the purpose of linking production and test facilities via storage and temperature conditioning facilities.

4. Complex facilities, herein designated as possible casting facilities, have been built at all of the installations except Kemerovo. These facilities are connected to double-base production elements by pipes/conveyers/walkways.

5. All of the sites except Kemerovo have one or more sets of facilities designated as possible temperature conditioning buildings.

REFERENCES

MAPS OR CHARTS

SAC. US Air Target Chart, Series 200, Sheet 0161-21HL, 2d ed, Aug 62, scale 1:200,000 (SECRET)

SAC. US Air Target Chart, Series 200, Sheet 0234-24A, 1st ed, Mar 59, scale 1:200,000 (SECRET)

SAC. US Air Target Chart, Series 200, Sheet 0159-23HL, 2d ed, May 63, scale 1:200,000 (SECRET)

SAC. US Air Target Chart, Series 200, Sheet 0161-2HL, 2d ed, Jul 62, scale 1:200,000 (SECRET)

ACIC. US Air Target Chart, Series 200, Sheet 0156-11HL, 1st ed, Jun 63, scale 1:200,000 (SECRET)

ACIC. US Air Target Chart, Series 200, Sheet 0165-15A, 1st ed, Sep 58, scale 1:200,000 (SECRET)

DOCUMENTS

NPIC. *Probable Solid Propellant Test Facility and Associated Production Facilities, Krasnoyarsk, USSR,* Jan 65 (TOP SECRET

NPIC. *Probable Solid Propellants Test Facility and Associated Production Facilities near Perm, USSR,* Jan 65 (TOP SECRET

NPIC. *Probable Solid Propellants Test Facility and Associated Production Facilities, Kamensk-Shakhtinskiy, USSR,* Feb 65 (TOP)

NPIC. *Probable Solid Propellants Test Facility and Associated Production Facilities, Biysk, USSR,* Feb 65 (TOP SECRET

NPIC. *Probable Solid Propellants Test Facility and Associated Production Facility, Sterlitamak, USSR,* Feb 65 (TOP SECRET

NPIC. *Probable Solid Propellant Rocket Motor Test Facility and Associated Production Facilities, Kemerovo, USSR,* May 65 (TOP SECRET

REQUIREMENT

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NPIC PROJECT

11144/65 (partial answer)